

difference between the cattle and freight cars, as well as the spaces between the cars, were plainly distinguishable. The background of the whole showed an excellent view of the Pembina Mountains, twenty miles farther off. The phenomenon vanished at 9.20 a. m. Another mirage, presenting some Dakota town to view, was observed on the 19th.—*Report of R. J. Boylan, observer, Signal Corps.*

Duluth, Minn.: a mirage was observed at 7 a. m., 11th. About forty miles of the Wisconsin shore of Lake Superior and the mouth of the Bryle River were plainly visible.—*Report of W. H. Fallon, observer, Signal Corps.*

#### SAND STORMS.

Sand storms were reported as follows: San Diego, Cal., 4th; Wilcox, Ariz., 11th, 18th; Fort Verde, Ariz., 11th.

#### SUN SPOTS.

Mr. M. A. Veeder, Lyons, N. Y.: 1st, 2d, 3d, and 4th groups of faculæ appeared by rotation; portions of these groups were seen near the western limb on the 14th, and returned again by rotation at the eastern limb on the 26th and 27th. On the 12th, 14th, and 17th, other groups of faculæ appeared by rotation. Observations were lacking on the 5th, 7th, 8th, 9th, 11th, 13th, 15th, 18th, 19th, 21st, 22d, 23d, 24th, 25th, 28th, 29th, and 30th.

Mr. C. E. Buzzell, Leaf River, Ill.: no spots were observed during the month. Clouds prevented solar observations on the 1st, 2d, 5th, 7th, 8th, 9th, 20th, 21st, and 22d.

Mr. John W. James, Riley, Ill.: none seen during the month. Mr. H. D. Gowey, North Lewisburgh, Ohio: no sun spots were seen during the month.

Haverford College Observatory, Pa., (observed by Prof. F. P. Leavenworth):

Date.	Number of new—		Disappeared by solar rotation.		Reappeared by solar rotation.		Total number visible.		Faculæ.		Remarks.
	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.	Groups.	Faculæ.	
Nov., 1889.											
1, 10 a. m. . . .	0	0	0	0	0	0	0	0	0	0	Definition poor.
3, 5 p. m. . . .	0	0	0	0	0	0	0	0	0	0	Definition poor.
4, 12 m. . . . .	0	0	0	0	0	0	0	0	1	1	Definition good.
5, 9 a. m. . . .	0	0	0	0	0	0	0	0	1	1	Definition good.
6, 9 a. m. . . .	0	0	0	0	0	0	0	0	1	1	Definition good.
7, 9 a. m. . . .	0	0	0	0	0	0	0	0	0	0	Definition good.
10, 10 a. m. . .	0	0	0	0	0	0	0	0	0	0	Definition good.
12, 9 a. m. . . .	0	0	0	0	0	0	0	0	2	2	Definition good.
14, 9 a. m. . . .	1	1	0	0	0	0	1	1	1	1	Definition good, spots small.
15, 10 a. m. . .	0	0	0	0	0	0	1	1	1	1	Definition good.
16, 10 a. m. . .	0	0	0	0	0	0	0	0	0	0	Definition poor.
22, 10 a. m. . .	0	0	0	0	0	0	0	0	1	1	Definition good.
23, 10 a. m. . .	0	0	0	0	0	0	0	0	1	1	Definition good.
24, 10 a. m. . .	0	0	0	0	0	0	0	0	0	0	Definition good.
26, 10 a. m. . .	0	0	0	0	0	0	0	0	0	0	Definition poor.
28, 10 a. m. . .	2	4	0	0	0	0	2	4	4	4	Definition good, spots small.
29, 9 a. m. . . .	1	1	1	2	0	0	2	2	5	5	Definition good, spots small.

### VERIFICATIONS.

#### FORECASTS FOR 24 HOURS IN ADVANCE.

[Verifications made by Assistant Professor C. F. Marvin, assisted by Mr. H. E. Williams, chief clerk of the Forecast Division.]

The forecasts for districts east of the Rocky Mountains for November, 1889, were made by 1st Lieutenant Richard E. Thompson, 6th Infantry, Signal Officer, and those for the Pacific coast districts were made at San Francisco, Cal., by 2d Lieutenant J. E. Maxfield, Signal Corps.

Percentages of forecasts verified, November, 1889.

States.		States.	
Maine.....	84.4	Kentucky.....	78.4
New Hampshire.....	77.1	Ohio.....	83.7
Vermont.....	76.5	West Virginia.....	81.9
Massachusetts.....	79.1	Indiana.....	81.1
Rhode Island.....	78.9	Illinois.....	80.2
Connecticut.....	72.5	Lower Michigan.....	85.4
Eastern New York.....	82.9	Upper Michigan.....	81.8
Western New York.....	80.8	Wisconsin.....	82.1
Eastern Pennsylvania.....	80.6	Minnesota.....	82.0
Western Pennsylvania.....	80.2	Iowa.....	86.3
New Jersey.....	80.0	Kansas.....	83.9
Delaware.....	78.5	Nebraska.....	80.6
Maryland.....	78.9	Missouri.....	80.2
District of Columbia.....	75.9	Colorado.....	77.5
Virginia.....	84.3	North Dakota.....	79.4
North Carolina.....	84.3	South Dakota.....	79.7
South Carolina.....	86.2	Southern California*.....	94.5
Georgia.....	86.9	Northern California*.....	83.7
Eastern Florida.....	85.0	Oregon*.....	84.9
Western Florida.....	86.7	Washington*.....	85.0
Alabama.....	77.0	By elements: Weather.....	85.4
Mississippi.....	81.7	Temperature.....	74.9
Louisiana.....	90.2	Monthly percentage of weather and temperature combined†.....	81.2
Texas.....	88.4		
Arkansas.....	79.4		
Tennessee.....	77.3		

\* In determining the monthly percentage of weather and temperature combined, the Pacific coast states are not included. † The monthly percentage of weather and temperature combined is determined by multiplying the percentage of weather by 6, and the percentage of temperature by 4, and dividing their sum by 10. ‡ The forecasts of temperature in districts east of the Rocky Mountains for November, 1889, were made with reference to the maximum temperature alone; that is, a prediction of warmer or cooler indicated that the maximum temperature of the day designated would be higher or lower than the maximum of the previous day.

#### FORECASTS FOR 48 HOURS IN ADVANCE.

Appreciating the great importance that long time predictions possess for the general public the Chief Signal Officer has authorized forecasts for forty-eight and seventy-two hours,

covering the second and third days in advance. Such forecasts are optional with the predicting officer, and are only made when clearly in the public interest, and cover, in all cases, considerable areas of country, and are not confined to localities.

Percentages of verifications of forecasts made for second day in advance. Number of predictions made: weather, 106; temperature, 62. Percentages of verifications: weather, 84.1; temperature, 88.4. Weather and temperature combined, 85.8.

No forecasts for seventy-two hours were made during the month.

#### CAUTIONARY SIGNALS FOR NOVEMBER, 1889.

Statement showing percentages of justifications of wind signals for the month of November, 1889:

*Wind signals.*—(Ordered by 1st Lieutenant R. E. Thompson.) Total number of signals ordered, one hundred and twenty-two; justified as to velocity, wholly, eighty-two, partly, four; justified as to direction, one hundred and twenty. Of the signals ordered, ninety-nine were cautionary, of which sixty-three were wholly, and one partly, justified; and twenty-three were storm signals, of which nineteen were wholly, and three partly, justified. Fifty-six signals were ordered for easterly winds, of which fifty-four were justified, and sixty-six were ordered for westerly winds, all of which were justified. Percentage of justifications, 70.1.

*Cold-wave signals.*—(Ordered by Assistant Professor T. Russell.) Total number of signals ordered, one hundred and sixty-one, of which fifty-one were justified.

Percentages of local verifications of weather and temperature signals reported by directors of the various State Weather Services for November, 1889.

States.	Weather.	Temperature.	States.	Weather.	Temperature.
Illinois.....	80.4	75.4	Nebraska.....	84.2	87.7
Indiana.....	81.0	83.0	New Jersey.....	86.7	96.0
Kansas.....	81.2	85.8	New York.....	87.3	84.8
Michigan.....	85.0	84.4	Ohio.....	84.0	83.0
Minnesota.....	77.0	82.0	Pennsylvania.....	89.0	85.0
Missouri.....	86.0	85.0	South Carolina.....	83.0	84.7

## STATE WEATHER SERVICES.

[Temperature in degrees Fahrenheit; precipitation, including melted snow, in inches and hundredths.]

The following extracts are republished from reports for November, 1889, of the directors of the various state weather services:

## ALABAMA.

The weather was generally mild and pleasant, but the last week of the month was so cold that the average temperature was reduced to 2° below the normal. The average precipitation was 2.19 above the normal. The rain was very uniformly distributed over the state.

## SUMMARY.

*Temperature.*—Monthly mean, 52.1; highest monthly mean, 70, at Eufaula; lowest monthly mean, 37, at Fayette and Valley Head; maximum, 82, at Butler, 1st; minimum, 20, at Elkmont, 30th; range for state, 62; greatest local monthly range, 58, at Butler; least local monthly range, 45, at Elkmont.

*Precipitation.*—Average for the state, 6.02; greatest, 8.57, at Evergreen; least, 2.75, at Gadsden.—*P. H. Mell, Signal Corps, Auburn, director.*

## ARKANSAS.

## SUMMARY.

*Temperature.*—Monthly mean for the state, 48.1; highest monthly mean, 63.5, at Malvern; lowest monthly mean, 41.7, at Winslow; maximum, 86, at Devall's Bluff, 15th; minimum, 17, at Winslow, 29th; range for state, 69; greatest local monthly range, 66, at Devall's Bluff; least local monthly range, 38, at Dayton.

*Precipitation.*—Monthly average for the state, 7.55; greatest monthly, 16.25, at Heber; least monthly, 0.41, at Prescott.—*M. F. Locke, Commissioner of Agriculture, Little Rock, director; W. U. Simons, Sergeant, Signal Corps, assistant.*

## COLORADO.

## SUMMARY.

*Temperature.*—The mean for the state was 29.1, a deficiency of 3.9, as compared with previous November records. The most marked departures were: Monte Vista, 11, Rocky Ford, 10, and Aspen, 9 below the normal; Climax, Fort Lewis, and Logmont are the only stations reporting the temperature in excess of the normal. The highest monthly mean was 39.6, at Lamar, and the lowest, 17.9, at Monte Vista; maximum temperature, 80, at Breckenridge, 10th; minimum, —16, at Breckenridge and Monte Vista, 12th; greatest monthly range, 96, at Breckenridge; least monthly range, 45, at Georgetown.

*Precipitation.*—The average for the state was 0.96, which is over fifty per cent. above the normal; greatest monthly, 4.70, at Breckenridge; least monthly, 0.00, at Amherst, and, trace, at Vilas. The following heavy snowfalls were reported: Breckenridge, 47; Gunnison, 36; and Leadville, 30.—*Prof. F. H. Loud, Colorado Springs, director; W. S. Miller, Corporal, Signal Corps, assistant.*

## ILLINOIS.

## SUMMARY.

*Temperature.*—Monthly mean for the state, 38; maximum, 72, at Flora and Golconda, 1st; minimum, —1, at Woodstock, 29th; mean of maximum temperatures for the state, 60.6; mean of minimum temperatures for the state, 8.0; monthly mean of the maximum and minimum temperatures, 39.0.

*Precipitation.*—Monthly average for the state, 3.80.

*Wind.*—Prevailing direction, northwest.—*John Craig, Sergeant, Signal Corps, Springfield, in charge.*

## INDIANA.

The weather during the month although cloudy was moderately warm and the mean temperature nearly normal.

## SUMMARY.

*Temperature.*—Monthly mean, 40; highest monthly mean, 46.5, at Jeffersonville; lowest monthly mean, 32.9, at Maury; maximum, 76, at Vevay, 1st; minimum, zero, at Maury, 30th; range for state, 53; greatest local monthly range, 66, at Vevay; least local monthly range, 41, at Columbia City.

*Precipitation.*—Average for the state, 4.90; greatest, 9.25, at Marengo; least, 2.50, at Marion.

*Wind.*—Prevailing direction, west.—*Prof. H. A. Huston, La Fayette, director; C. F. R. Wappenhans, Sergeant, Signal Corps, assistant.*

## IOWA WEATHER CROP BULLETIN SERVICE.

## SUMMARY.

*Temperature.*—Monthly mean, 33.1; highest monthly mean, 39, at Washington; lowest monthly mean, 27.6, at Carroll; maximum, 68, at Blakeville, 9th and 20th; minimum, —3, at Bancroft, 28th; average maximum, 58; average minimum, 3.3; greatest local monthly range, 68, at Blakeville; least local monthly range, 50, at Keokuk, Carroll, McCausland, and Larrabee; monthly range for the state, 71; average monthly range, 54.8.

*Precipitation.*—Average for the state, 1.37; greatest, 2.61, at Blakeville; least, 0.62, at Independence.

*Wind.*—Prevailing direction, northwest.—*G. M. Chappel, Sergeant, Signal Corps, Des Moines, in charge, Iowa Weather Crop Bulletin Service.*

## KANSAS.

## SUMMARY.

*Temperature.*—The temperature is deficient over the entire state, the deficiency being greatest in the southeastern counties, where it amounts to 4. It gradually diminishes toward the west, being 2 in Ford. Monthly mean for the state, 37.5; highest monthly mean, 42.3, at Lakin; lowest monthly mean, 31.0, at Allison; maximum, 76, at Sedan, 23d; minimum, 4, at McAllister, 16th; range for state, 72; greatest local monthly range, 62, at Lebo; least local monthly range, 42, at Weskan; greatest daily range, 43.7, at Lebo, 18th; least daily range, 2.9, at Toronto, 26th.

*Precipitation.*—The precipitation is normal in the extreme southeastern counties, slightly deficient in the northern part of Douglas and thence through the northeastern counties, but it is about normal in the extreme western. Average for the state, 1.43; greatest monthly, 3.75, at McPherson; least monthly, 0.10, at Grinnell.

*Wind.*—Prevailing direction, northwest.—*Prof. J. T. Lovewell, Topeka, director; T. B. Jennings, Sergeant, Signal Corps, assistant.*

## KENTUCKY.

The month was characterized by an excess of cloudy and rainy weather.

## SUMMARY.

*Temperature.*—The average temperature for the state for November, as deduced from the tri-daily observations, was 43.1; from the mean of the average maximum and average minimum temperatures, 43.3. These figures indicate a departure of about 2 below the normal for the month. The highest temperature recorded during the month was 78, at Franklin, on the 1st, and the lowest, 10, at Owenton, on the 30th. The average monthly range of temperature was 55.3; the greatest, 62, at Owenton, and the least, 43, at Murray. The highest temperatures were, without exception, recorded on the 1st, and the lowest, on the 29th and 30th.

*Precipitation.*—The average precipitation for the month was 6.04, which is about 2.00 in excess of the normal amount. This reduced somewhat the existing yearly deficiency, which, however, on the 30th, was still 12.30 at Louisville. The greatest amount of precipitation reported during the month was 7.43, at Princeton, and the least, 4.03, at Ashland. Snows were quite general throughout the state on the 18th and 30th. The greatest monthly depth reported was 6.5.

*Wind.*—Prevailing direction, west.—*Dr. E. A. Grant, Louisville, director, Frank Burke, Sergeant, Signal Corps, assistant.*

## LOUISIANA.

A normal temperature is obtained for the southern section. In the northern section there was a deficiency of 2.0 for the month. The average rainfall for the state was deficient by 0.10, but the deficiency in the southern section was 0.75. In the northern section there was an excess of nearly 1.00.

## SUMMARY.

*Temperature.*—Monthly mean, 54.3; highest monthly mean, 58.7, at New Orleans; lowest monthly mean, 51.2, at Farmerville; maximum, 89, at New Iberia, 1st; minimum, 24, at Coushatta and Clinton, 29th, and at Natchitoches and Amite, 29th and 30th; range for the state, 65; greatest local monthly range, 60, at Vidalia, Amite, Plaquemine, and Cameron; least, 39, at Shell Beach; mean daily range, 23.3.

*Precipitation.*—Average for the state, 4.57; for the northern section, 6.01; southern section, 3.49; greatest local monthly, 9.10, at Shreveport and Columbia; least local monthly, 2.18, at New Orleans; excessive daily rainfalls, 2.57 at Shreveport, on 6-7th, 3.00 at Columbia, on 7th and 12th, and 2.90 at Coushatta, on 6th.

*Wind.*—Prevailing direction, northwest.—*R. E. Kerkam, Sergeant, Signal Corps, New Orleans, in charge.*

## MICHIGAN.

The temperature was above the average in all sections, and there were no decided falls in temperature until the afternoon of the 28th, and the temperature fell to below zero in the northern portion of the state by the 30th.

## SUMMARY.

*Temperature.*—The mean temperature for the month, 36.4, is 0.2 above the normal of fourteen years. The temperature was above the normal on thirteen days, normal on four, and below normal on thirteen. The highest daily mean temperature, 47, occurred on the 2d, when the temperature was 4 above the normal, and the lowest, 21, on the 30th, when it was 6 below the normal. The highest daily mean temperature in the past fourteen Novembers, 58, occurred on the 1st, 1876, and the lowest, 5, on the 21st, 1880. The highest monthly mean temperature, 38.3, occurred in 1878 and 1888, and the lowest, 27.5, in 1880. The maximum temperature for the month, 65, occurred at Gladwin on the 2d, and the lowest, —4, on the 30th, at Chase.

*Precipitation.*—The average for the month, 2.87, is 0.06 below the average of fourteen years. The precipitation was below the average in the Upper Peninsula and the central section, 0.77 in the former and 0.30 in the latter, and was above the average 0.01 in the northern section and 0.34 in the

southern section. The greatest departure from the average occurred in the southwest portion of the state, where the precipitation ranged from 1.00 to 3.00 above the average. The precipitation in the Upper Peninsula was below 2.00, except at Lathrop and Saint Ignace. The largest amount recorded, 5.60, occurred at Buchanan, and the least, 0.52, at Crystal Falls.

*Wind.*—Prevailing direction, southwest.—*N. B. Conger, Sergeant, Signal Corps, Lansing, director.*

#### MINNESOTA.

The average temperature for the state for November, 27.3, nearly coincides with the normal, the departure being only a fraction of a degree. The temperature was 4.5 in excess in the extreme northwest, nearly normal at Moorhead, 2 in excess at Duluth, and in the southern half of the state there was a deficiency of from 1 to 2.

The precipitation averaged 1.10, this is a deficiency of about 15 per cent. The counties in the northwest and southeast received more than the usual quantity, while the deposit was deficient in all other districts, notably so at Moorhead, where the greatest single measurement was only 0.04, and the total for the month less than 0.2.

#### SUMMARY.

*Temperature.*—Highest monthly mean, 32.0, at La Crosse, Wis.; lowest monthly mean, 23.0, at Pokegama Falls; maximum, 64, at Montevideo, 6th; minimum, —25, at Pokegama Falls, 29th; range for state, 89; greatest local monthly range, 75, at Pokegama Falls; least local monthly range, 52, at La Crosse, Wis., and Farmington; greatest daily range, 44, at Montevideo, 8th; least daily range, 2.7, at Owatonna, 14th.

*Precipitation.*—Greatest, 2.40, at Rolling Green; least, 0.09, at Morris.

*Wind.*—Prevailing direction, northwest.—*John Healy, Private, Signal Corps, Saint Paul, in charge.*

#### MISSISSIPPI.

#### SUMMARY.

*Temperature.*—The monthly mean temperature for the state, 51, is nearly 3 below the normal; highest monthly mean, 56.5, at Pearlinton and Logtown; lowest monthly mean, 44.9, at Macon; maximum, 89, at Macon and Aberdeen, 1st; minimum, 18, at Louisville, 30th; range for the state, 71; greatest local monthly range, 68, at Port Gibson; least local monthly range, 42, at Pearlinton.

*Precipitation.*—The monthly average for the state, 3.79, is 0.85 below the normal; greatest monthly, 6.78, at Mobile, Ala.; least monthly, 0.05, at Hazlehurst.

*Wind.*—The wind was very variable, and its prevailing directions at stations are variously reported as being from the southeast at the southern and from the north or northwest at stations farther north.—*R. B. Fulton, Signal Corps, University, director.*

#### MISSOURI.

#### SUMMARY.

*Temperature.*—The highest average monthly temperature was 44.2 and 42, at Cairo, Ill., and Proteem, respectively; the lowest means were reported from the northwest, 33.3, at Harrisonville, and 34.1, at Oregon; the lowest temperatures of the month were 8, at Keokuk, Iowa; 9, at Sedalia; 9.8, at Glasgow, and 10, at Kansas City; at Cairo, Ill., and Proteem the lowest temperature was 20; at all other stations the minimum for the month was below 20; the highest temperature reported was 76, at Proteem.

*Precipitation.*—The rainfall in the state was less than 1.00 in the extreme northwest, increasing to 5.50 in the southeastern part. This is a normal distribution for November rainfall, although the amount is everywhere in excess of the normal amount.—*Prof. Francis E. Nipher, Saint Louis, director.*

#### METEOROLOGICAL REPORT OF THE MISSOURI STATE BOARD OF AGRICULTURE.

#### SUMMARY.

*Temperature.*—Monthly mean, 40.1; highest monthly mean, 44.2, at Cairo, Ill.; lowest monthly mean, 36.3, at Harris; maximum, 76, at Proteem, 23d; minimum, 6, at Frankford, 29th; range for the state, 70; greatest local monthly range, 63, at Sedalia; least local monthly range, 34, at Marshfield.

*Precipitation.*—Average for the state, 3.43; the greatest was 6.25, at Hermann, and the least, 1.36, at Warrensburg. The greatest amount of unmelted snow during the month was 6.0 inches, at Ironton.

*Wind.*—Prevailing direction, northwest.—*Levi Chubbuck, Secretary of State Board of Agriculture, Columbia, director; A. L. McRae, Sergeant, Signal Corps, assistant.*

#### NEBRASKA.

The month of November has presented no remarkable feature, unless it be the early occurrence of a considerable fall of snow. The precipitation and cloudiness have been a little above the normal, and the temperature was two or three degrees below.

#### SUMMARY.

*Temperature.*—The mean for the month for the southeastern portion of the state, 33.5, is 2.5 below the normal; maximum, 75, at Alliance; minimum, —12, at Fort Niobrara, 12th.

*Precipitation.*—Over the western part of the state the precipitation has not amounted to 1.00; over an irregular area in the eastern part it has exceeded 1.00, with three limited localities where over 2.00 fell.—*Prof. Goodwin D. Swezey, Crete, director; G. A. Loveland, Corporal, Signal Corps, assistant.*

#### NEVADA.

#### SUMMARY.

*Temperature.*—The temperature has been nearly normal throughout the state, the average from 29 stations being 39.5, which is 0.8 below the normal. The highest temperature reported was 80.8, at El Dorado Canyon, on the 23d, and the lowest reported was 4, at Elko, on the 4th, which gives 76.8 as the extreme range for the state.

*Precipitation.*—Precipitation was general throughout the state from the 18th to the end of the month, being heaviest in Washoe, Storey, Ormsby, and Douglas counties, and the northern portion of Esmeralda county. The greatest amount reported from any one station was 5.45, at Genoa, where 4.73 fell on the 18th, 19th, 20th, and 22d. Following Genoa came Lewers' Ranch, with 5.04, and Verdi, with 3.43. At stations in high altitudes snow fell in amounts from 0.5 to 9, which latter amount is reported from Tuscarora. The copious rains have started vegetation in many localities, giving the stockmen great relief. At Ferguson's Ranch, Churchill Co., alfalfa is reported in excellent condition.

*Wind.*—Prevailing direction, south.—*Prof. Chas. W. Friend, Carson City, director; H. E. Wilkinson, Corporal, Signal Corps, assistant.*

#### NEW ENGLAND METEOROLOGICAL SOCIETY.

The average temperature was about 3 above the normal, and there was an excess of about 2.50 over the normal amount of precipitation.

#### SUMMARY.

*Temperature.*—Monthly mean, 41.1; highest monthly mean, 46.9, at Block Island; lowest monthly mean, 28.4, at Weathersfield Centre; maximum, 68, at Lunenburg, 3d; minimum, —3, at Weathersfield Centre, 30th; range for New England, 71; greatest local monthly range, 68, at Lunenburg; least local monthly range, 32, at Nantucket; greatest daily range, 44, at Weathersfield Centre, 14th; least daily range, 0.7, at Woonsocket, 27th. The average temperature for twenty-five stations, having records for more than ten years, is 38.7; the average for November, 1889, is 41.9; departure, +3.2.

*Precipitation.*—Average for New England, 6.12; greatest, 10.03, at Shelton; least, 2.46, at Nantucket. The average precipitation for November, for thirty-four stations having records for more than ten years, is 4.15; the average for November, 1889, is 6.20; departure +2.05.

*Wind.*—Prevailing direction, west.—*Prof. William H. Niles, Boston Mass., president; Prof. Winslow Upton, Providence, R. I., secretary; L. G. Schultz, Sergeant, Signal Corps, assistant.*

#### NEW JERSEY.

#### SUMMARY.

*Temperature.*—The mean temperature for the month, 45.7, is 3.6 above the normal, and 0.1 below the average for the corresponding month of 1888; highest monthly mean, 49.6, at Cape May C. H. and Woodbury; lowest monthly mean, 40.5, at Hanover; maximum, 74, at Tenafly, 17th; range for state, 61; greatest local monthly range, 61, at Tenafly; least local monthly range, 34, at Billingsport and Trenton; greatest daily range, 38, at Cape May C. H., 15th; least daily range, 2, at Moorestown, New Brunswick, Trenton, and Union, 8th, and at Lambertville, 21st.

*Precipitation.*—The average for the state, 8.48, is 5.06 above the average for the month; greatest, 11.45, at Belleville; least, 4.70, at Ocean City.

*Wind.*—Prevailing direction, northwest.—*E. W. McGann, Sergeant, Signal Corps, New Brunswick, in charge.*

#### NEW YORK.

#### SUMMARY.

*Temperature.*—The highest temperature reported was 70, at Savona, 2d; and the lowest was 5, at Number Four, 16th. The mean temperature for the state was 40, the 2d being the warmest, and the 16th the coldest day. The greatest local monthly range of temperature was 48.5, at Lyons; and the least was 33.2, at Brooklyn. The temperature was much above the average.

*Precipitation.*—The average precipitation for the state was 5.20, or much above the normal amount. The greatest monthly rainfall was 11.66, at White Plains; and the least was 2.21, at Saranac Lake. The average number of days on which the precipitation was 0.01, or more, of rain or snow was 14.5. Snow was reported from 24 stations between the 26th and 30th; the fall being quite generally distributed over the state. The greatest amount, 13.2, fell at Canton on the 27th and 28th.

*Wind.*—Prevailing direction, southwest.—*Prof. E. A. Fuertes, Ithaca, director; I. W. Brewer, Private, Signal Corps, assistant.*

#### NORTH CAROLINA.

#### SUMMARY.

*Temperature.*—The monthly mean temperature for the state, 52.3, is 1.7 above the normal of the last eight years; maximum, 81, at Chapel Hill, 1st; minimum, 15, at Asheville, 29th; range for the state, 66; highest monthly mean, 58.4, at Southern Pines; lowest monthly mean, 44.2, at Marion, Va.; greatest monthly range, 61, at Mount Pleasant; least monthly range, 44, at Hatteras and Mount Airy.

*Precipitation.*—The average for the state, 4.14, is 0.05 above the normal. The rainfall was about 1.00 in excess in the western portion of the state, and slightly deficient in the central and eastern portions. The greatest monthly rainfall was 6.58, at Knoxville, Tenn., and the least monthly, 2.18, at Southport. The heaviest rainfall for November that has occurred in the state during the last sixteen years was 13.02, at Hatteras, in 1884.

*Wind.*—Prevailing direction, southwest; average direction, as deduced from many years observations, northeast.—*Dr. Herbert B. Battle, Raleigh, director; C. F. von Herrmann, Sergeant, Signal Corps, assistant.*

#### NORTH AND SOUTH DAKOTA.

The monthly mean temperature for the states is about normal, or possibly 1 below, and the average temperature is about 0.31 below the normal.

##### SUMMARY.

*Temperature.*—Monthly mean, 27.0; highest monthly mean, 33, at Spearfish and Rapid City; lowest monthly mean, 20, at Napoleon; maximum, 75, at Wapeton, 9th; minimum, —28, at Fort Buford, 28th; range for the states, 103; greatest local monthly range, 89, at Fort Buford; least local monthly range, 55, at Canton.

*Precipitation.*—Average for the states, 0.33; greatest monthly, 1.08, at Canton; least monthly, trace, at Clark and Woonsocket.—*S. W. Glenn, Sergeant, Signal Corps, Huron, in charge.*

#### OHIO.

##### SUMMARY.

The mean temperature of the northern section was 40.5, of the middle section, 40.3, and of the state, 41.0. These means are 0.8, 0.3, and 0.3 above the averages for the past eight years. The mean temperature of the southern section, 42.4, was 0.1 below the eight year average. The maximum temperature reported was 77.0, at Hanging Rock, 1st, and the minimum, 8.6, at Wauseon, 30th. The mean daily range of temperature was 15.1. The greatest daily range was 38.5, at Portsmouth, 12th, and the smallest, 2.0, at Cincinnati, on the 22d.

*Precipitation.*—The mean rainfall in the northern section, 2.81, was 0.03 below the eight year average. The mean in the middle section was 4.38, and in the southern section, 4.85. These means are 1.14 and 1.64 above the averages for these sections for November. The mean for the state, 4.02, is 0.92 above the average. The greatest monthly rainfall reported was 8.00 at West Milton, and the smallest, 1.71, at Sandusky and Vienna.

*Wind.*—Prevailing direction, west.—*Prof. B. F. Thomas, Columbus, director; Lieut. Charles E. Kilbourne, secretary; C. M. Strong, Corporal, Signal Corps, assistant.*

#### OREGON.

##### SUMMARY.

*Temperature.*—The monthly average for the state, 42.7, is 2.1 above the normal. The average excess along the immediate coast is 2.8; in the interior valleys, 2.3; and in the eastern portion of the state, 1.2. The mean temperature along the coast was 50; in the interior valleys, 46; and in eastern Oregon, 39; highest monthly mean, 50.8, at Bandon; lowest monthly mean, 33, at Joseph and North Powder; maximum, 74, at Bandon; minimum, 5, at North Powder; range for state, 69.

*Precipitation.*—The precipitation was below the average in all sections of the state, except in Douglas and Coos counties, and undoubtedly in all southwestern counties. The deficiency ranged from 5.00, at Fort Canby, to 0.35, at Mount Angel. Along the coast from 4.00 to 7.00 fell; in the interior valleys from 3.00 to 5.00; and in eastern Oregon about 0.75. The average for the state was 3.00.

*Wind.*—Prevailing direction, southwest.—*Hon. H. E. Hayes, Master State Grange, Portland, director; B. S. Pague, Sergeant, Signal Corps, assistant.*

#### PENNSYLVANIA.

##### SUMMARY.

*Temperature.*—The mean temperature of sixty-six stations was 41.9, which is from 2 to 3 above the normal, and the same as that of November, 1888. The means of the daily maximum and minimum, 48.8 and 34.7, give a mean temperature of 41.8, and an average daily range of 14.1. The highest temperatures reported during the month were Greensburgh, 73; Annville and Centre

Valley, 71. The lowest were Dyberry, Somerset, and Coudersport, 10; Lock Haven, Wellsborough, and Columbus, 12.

*Precipitation.*—The average precipitation for the state was 6.72, which is double the usual quantity for November. As there was only a slight excess in the northwestern portion of the state, this ratio was greater in other parts. The greatest totals were Girardville, 10.16; Meyerstown, 9.99; Westchester, 9.91; Eagle's Mere, 9.27; Pottstown, 9.15; and Lancaster, 9.02. Excessive rains occurred on the 18th and 19th, which caused heavy freshets along the Susquehanna, that carried away railroad bridges and rafts of lumber.

*Wind.*—Prevailing direction, west.—*Under direction of the Franklin Institute, Philadelphia; T. F. Townsend, Sergeant, Signal Corps, assistant.*

#### SOUTH CAROLINA.

The monthly mean temperature for the state is over 2.0 higher than the mean of November in either 1887 or 1888. The average monthly rainfall for the state was over one inch in excess of that for November in either of the two preceding years.

##### SUMMARY.

*Temperature.*—Monthly mean temperature, 54.8; maximum, 84, at Saint Matthew's, 1st; minimum, 18, at Spartanburgh, 30th; range for state, 66.

*Precipitation.*—Monthly average for the state, 3.84; greatest monthly, 7.28, at Charleston; least monthly, 0.66, at Chester.

*Wind.*—Prevailing direction, west.—*Hon. A. P. Butler, Columbia, director; J. W. Cronk, Sergeant, Signal Corps, assistant.*

#### TENNESSEE.

The month of November was in many respects an abnormal one in its meteorological features. While the temperature was about the normal, the rainfall was excessive and the percentage of cloudiness was much above the normal. The snowfall was much in excess of the usual amount for this month.

##### SUMMARY.

*Temperature.*—The mean temperature was 47.8, the normal for the past seven years. The highest local monthly mean was 51.9, at Cog Hill, and the lowest was 44.2, at Rugby and Nunnally. The highest temperature observed was 80, on the 1st, at Savannah; and the lowest was 19, on the 30th, at Rugby, the first and last days of the month showing the extremes of temperature. The maximum temperature was, with two or three exceptions, recorded on the 1st, and the minimum, with a few exceptions, on the 29th. The daily ranges of temperature were generally less than usual for November.

*Precipitation.*—The average precipitation was 6.62, being the greatest November average during the past seven years, the next greatest being 6.39, in 1886. This amount is 2.50 above the November mean for the past seven years. Of this amount the eastern division received an average of about 5.75, the middle and western divisions each a little more than 6.75. There were fourteen days of general rains, including snowfall. The greatest monthly rainfall, 9.83, was reported at Trenton. This was the greatest local amount reported in November during the past seven years, the next greatest being 8.89, at Memphis, in 1886. The greatest local daily rainfall was 3.07, reported at Knoxville on the 8th; the next greatest was 2.83, at Trenton, on the 18th.

*Wind.*—Prevailing directions, north and west.—*J. D. Plunket, M. D., Nashville, director; H. C. Bate, Signal Corps, assistant.*

#### TEXAS.

##### SUMMARY.

*Temperature.*—The mean temperature over the state ranged from 36, at Fort Elliott, to 65, at Brownsville; the highest temperature was 85, at Brownsville, on the 21st; at Cuero, on the 24th; and at College Station, on the 25th; the lowest was 17, at Fort Elliott, on the 29th.

*Precipitation.*—The precipitation during the month was heaviest over the eastern portion of the state, where, at Tyler, it exceeded 10.00, and decreased with marked regularity westward to the one hundred and second meridian, west of which the amount did not exceed 1.00.—*D. D. Bryan, Galveston, director; I. M. Cline, Sergeant, Signal Corps, assistant.*

## NOTES AND EXTRACTS.

### EQUINOCTIAL STORMS.

[Prepared by Assistant Professor H. A. HAZEN, by order of the Chief Signal Officer, to meet the numerous demands made upon this office for information relative to equinoctial storms.]

There have come to the Signal Office, from time to time, inquiries regarding the existence of storms about the 21st of March and 21st of September of each year. There also seems to be a fairly well-grounded belief in the minds of many intelligent persons that the so-called equinoctial storms, or storms influenced, if not generated, by the seeming passage of the sun across the equator, have a real existence. Others have gone still farther and have considered that the equinoctial points of the planets have an important bearing upon terrestrial weather. When it is considered that the equinoxes are wholly imaginary points in the sky, or the intersections of two imaginary lines, the equator and the path of the sun, we must conclude at once that the apparent presence of the sun at either of these points can have absolutely no effect upon

our weather. It might be thought that somehow the lengthening day at the spring equinox and the corresponding shortening one in the fall might affect the weather. However, not only are these directly contrary to each other and therefore incapable of producing like effects, but also the increase or diminution is only two and one-half minutes daily, and the action is a continuous one for weeks before and after the equinox, so that on all accounts it is impossible for us to consider that there can be any effect whatever from this cause.

There still remains this consideration, that possibly there is a recurring storm period about the 21st of March and 21st of September which may be entirely independent of the equinoxes. This question, though entirely different from the previous one, has been carefully investigated by Prof. R. H. Scott, of London. He collected all the severe storms that passed over Great Britain for fourteen years, and found that out of forty-five storms in March not one occurred on the 21st, and out of eighteen storms in September, only one occurred on the 21st.